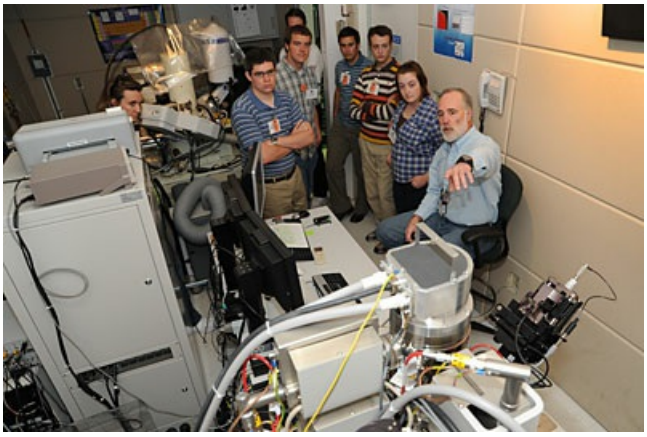


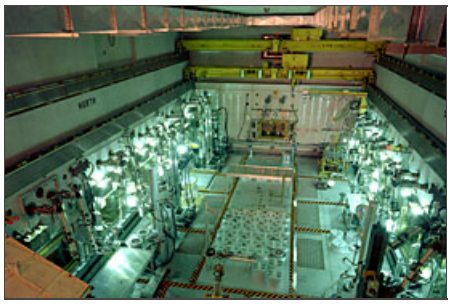
Fifty researchers from 26 different universities and 18 countries are enrolled in this year's ATR National Scientific User Facility Users Week. Participants learn about state-of-the-art nuclear research capabilities at INL.

National labs collaborate with academia to design accident-tolerant nuclear fuel

By Nicole Stricker, *INL Communications & Governmental Affairs*

Nuclear engineers are a special breed of perfectionist. They're constantly striving to design ever more efficient reactor systems and more robust fuels and materials. The work requires detailed understanding of how radiation affects materials — knowledge verified primarily via specialized equipment.

The U.S. Department of Energy's national lab complex, and hence the taxpayers, own the equipment that makes the research underlying these improvements possible. Exceptional expertise, unique infrastructure, nuclear materials and strategic partnerships converge at Idaho National Laboratory, the national nuclear energy laboratory. The DOE increases use of these capabilities through its Advanced Test Reactor National Scientific User Facility (ATR NSUF).



The Hot Fuels Examination Facility at INL's Materials & Fuels Complex is one of many state-of-the-art nuclear research capabilities participants will visit.

The user facility gives academic, laboratory, and industry researchers access to one-of-a-kind nuclear research capabilities at INL and across the nation. The user facility fosters collaborations between industry, academia and national labs while offering novel research opportunities to help train the next generation of nuclear scientists and engineers.

The creative spark for such projects and collaborations often occurs at the facility's annual Users Week, which begins today. Dozens of researchers from around the world are converging at INL to learn more about collaboration opportunities that help move nuclear energy technology forward.

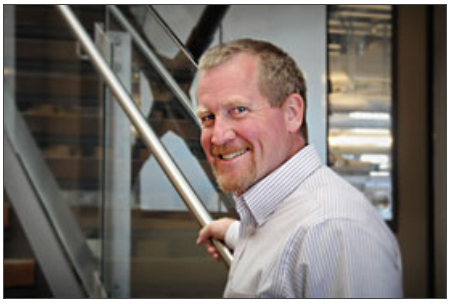
Fifty researchers from 26 different universities and 18 countries are enrolled. Participants include 31 students, 11 faculty members, and eight representatives from industry or other labs. They'll learn about the most pressing nuclear design questions today and how user facility capabilities can help answer them.

"We're bringing in expert speakers from around the world," said Users Week organizer Jeff Benson. "Potential users can learn more about the research needs and link with current users. Plus, this is a chance for people from different institutions to come together and conceive research proposals."

The heart of the reactor

The theme at this year's Users Week is nuclear fuel and the central questions driving fuel design research.

"The fuel is the heart of the reactor," said Mitchell Meyer, director of INL's Nuclear Fuels and Materials Division. "Without the right fuel, you can design the most elegant reactor and it won't work."



Nuclear scientists and engineers are working to design fuels that are more resistant to catastrophic accidents. Such fuels would add to the multiple layers of protection at new and existing nuclear energy plants.

For example, fuels encased (or "clad") in materials that don't contain zirconium wouldn't release as much hydrogen if they heated up unexpectedly during an accident. Hydrogen released from overheated zirconium cladding could combust under certain conditions.

But replacing zirconium in nuclear fuel cladding requires nuclear engineers and material scientists to find another material that matches or exceeds zirconium's benefits. The two primary considerations:

Mitchell Meyer, director of INL's Nuclear Fuels and Materials Division, is giving the keynote address about nuclear fuel design questions.

how a material's properties are affected by radiation and how the addition of a new material affects the ability of the reactor to create heat and safely transform that heat into electricity.

Detailed information about such properties is crucial to evaluate candidate fuel materials.

"We don't have irradiation behavior data for many of the materials that researchers would like to consider for use in reactors," said Meyer. "The ATR National Scientific User Facility makes it possible to get that data."

That's why the NSUF Users Week presents such a powerful opportunity for the nuclear research community.

A single experiment portal

Learning about the state of nuclear energy research enables participants to propose research projects and form collaborations that can answer important questions. The NSUF does more than provide ATR irradiation space to external researchers. It gathers relevant national capabilities, at both universities and national laboratories, for reactor-based testing and analysis into a single portal through which the best scientific ideas are paired with the nation's unique experimental capabilities.

The NSUF's annual Users Week highlights those capabilities for participants, who also get a rare chance to tour these distinctive facilities.

Users Week provides an opportunity to learn more about research and collaboration opportunities that can help move nuclear energy technology forward.

As this year's keynote speaker, Meyer will highlight the central issues that drive the design of new nuclear fuels. Detailed presentations about metal, oxide and particle fuel fabrication from experts at INL, Los Alamos National Laboratory and Oak Ridge National Laboratory will follow. Experts from INL, ORNL, Pacific Northwest National Lab and University of Michigan will discuss state-of-the-art research tools and techniques.

The week concludes with a research forum highlighting results from three recent NSUF projects.

The Users Week activities come on the heels of a similar weeklong conversation at ORNL. The Modeling Experimentation and Validation (MeV) summer school June 11-16 focused on advanced modeling capabilities, irradiated materials research and distinctive capabilities at ORNL.

The unprecedented two-week event provides students, faculty and early career professionals with an overall picture of the important link between modeling and experiment in the global materials and fuel development process. For more on the Office of Nuclear Energy's Advanced Test Reactor National Scientific User Facility, its annual Users Week, or the Modeling Experimentation and Validation (MeV) summer school, visit the ATR NSUF website.

(*Posted June 18, 2012*)

Feature Archive